# Signal Processor

At right, a researcher is using a Model 3100 Frequency Domain Processor, an innovative instrument that significantly increases the amount and accuracy of information available from laser velocimeter flow measurement systems. The Model 3100 is shown in closeup at lower right; it is a commercial version of a system invented by a team of scientists from Langley Research Center and Old Dominion University Research Foundation, Norfolk, Virginia.

The system is manufactured by Macrodyne, Inc., Clifton Park, New York. In 1986, Macrodyne received a Small Business Innovation Research award for development of a proof-of-concept prototype of the processor. In mid-1989, the company delivered the first units to Ames and Langley Research Centers for evaluation and use. In August 1989, Macrodyne was granted a NASA license to use the technology in commercial manufacture of the Frequency Domain Processor. The innovation permits use of laser velocimetry in industrial applications where extremely precise measurements are required; it has applicability in industrial controls and in improvement of transmission standards in the automotive industry.

The benefits of the Model 3100 stem from patented digital signal processing techniques. Laser velocimetry is a method of measuring the velocities of micron-size particles in fluids or microscopic flaws in surfaces, utilizing a system of crossed laser beams by creating a "fringe pattern" of lighted bands. Particles passing through the fringe scatter light from the lighted bands. A burst of the oscillating light about a microsecond long is captured and converted to an electrical signal.

As with any measurement sensor, a major factor in the success of the technique is the signal processor. The principal utility of the Model 3100 signal processor is determination, by means of digital signal processing, of the oscillating frequency of the captured burst. This allows accurate computation of the velocity of the particle passing through the lighted bands. In comparison with conventional techniques, digital signal processing offers an eightfold increase in measurable signals and fivefold gain in measurement accuracy.